Claims

[c1] 1. A light coupling apparatus for coupling a linear diode laser array to an optical fiber comprising a wedge-shaped coupling element having a height (h) substantially equal to a length defined by said linear diode laser array, said coupling element having a length (L) extending from an input surface to an output surface, said input surface receiving emitted light from a plurality of diode lasers within said linear diode laser array, said input surface having a first width (w1) facetted in a direction along the height (h) to direct said light towards said output surface having a second width (w2), said output surface being curved in a direction perpendicular to said height (h) to substantially collimate said light.

[c2] 2. The light coupling apparatus of claim 1 wherein said first width (w1) is greater than or equal to said second width (w2).

[c3] 3. The light coupling apparatus of claim 2 wherein said second width (w2) is substantially equal to a diameter of said optical fiber.

[c4] 4. A method of coupling the output of a linear diode laser array into an end of an optical fiber comprising the steps of:
optically coupling along a linear axis spaced at a first distance (d1) from said linear diode laser array a wedge-shaped coupling element having a height (h) substantially equal to a length defined by said linear diode laser array, said coupling element receiving emitted light from a plurality of diode lasers within said array and directing said light toward an output surface having a second width (w2) by way of an input surface having a first width (w1) facetted in a direction along said height (h) and curved in a direction perpendicular to said height (h); and
optically coupling light from said output surface into an end of the optical fiber, said optical fiber having a diameter substantially equal to said second width (w2).

[c5] 5. A method according to claim 4 wherein said first width is greater than or equal to said second width.

[c6] 6. A light coupling apparatus for coupling a linear diode laser array to an optical fiber comprising:

a cylindrical lens positioned adjacent and substantially parallel to the linear diode laser array, said cylindrical lens having a length substantially equal to a length of the linear diode laser array, said cylindrical lens receiving emitted light from a plurality of diode lasers within said linear diode laser array and collimating said light; and

a wedge-shaped coupling element between said cylindrical lens and said optical fiber, said coupling element having a length (L) extending from an input surface to an output surface, said input surface having a radius of curvature along a height (h), said height being substantially equal to said cylindrical lens length, said coupling element tapering from said input surface to said output surface, said input surface having an associated first width (w1) and said output surface having an associated second width (w2), the first width being substantially equal to a diameter of said cylindrical lens, and the second width being substantially equal to a diameter of said optical fiber.

[c7] 7. The light coupling apparatus of claim 6 wherein said first width is greater than or equal to said second width.

[c8] 8. The light coupling apparatus of claim 6 wherein said cylindrical lens has a circular, elliptical or hyperbolic cross-section.

[c9] 9. The light coupling apparatus of claim 6 wherein said coupling element length (L) is approximately 10mm and said first and second widths are approximately 1 to 3 mm.

[c10] 10. The light coupling apparatus of claim 6 wherein said cylindrical lens is at a first distance (d1) from said linear diode laser array and said input surface of said coupling element is at a second distance (d2) from said cylindrical lens and wherein said first and second distances are substantially equal.

[c11] 11. The light coupling apparatus of claim 6 wherein said radius of curvature of said coupling element input surface is configured to minimize reflection received light from interior sides of said coupling element.

[c12] 12. The light coupling apparatus of claim 11 wherein said coupling element length (L) and said input surface height (h) are configured such that an angular spread of light within said coupling element matches an acceptance angle of said optical fiber.

[c13] 13. A lighting apparatus comprising:
a linear diode laser array comprising a plurality of spaced-apart diode lasers each emitting divergent laser light;
a cylindrical lens positioned at a first distance (d1) and substantially parallel to the linear diode laser array, said cylindrical lens having a length substantially equal to a length defined by said plurality of diode lasers, said cylindrical lens receiving emitted light from said plurality of diode lasers and collimating said light; and
a wedge-shaped coupling element at a second distance (d2) from said cylindrical lens, said coupling element having a length (L) extending from an input surface to an output surface, said input surface having a radius of curvature along a height (h), said height being substantially equal to said cylindrical lens length, said coupling element tapering from said input surface to said output surface, said input surface having an associated first width (w1) and said output surface having an associated second width (w2), the first width being substantially equal to a diameter of said cylindrical lens; and
an optical fiber adjacent said output surface of said coupling element, said second width being substantially equal to a diameter of said optical fiber.

[c14] 14. The light coupling apparatus of claim 13 wherein said first width is greater than or equal to said second width.

[c15] 15. The light coupling apparatus of claim 13 wherein said cylindrical lens has a circular, elliptical or hyperbolic cross-section.

[c16] 16. The light coupling apparatus of claim 13 wherein said coupling element length (L) is approximately 10mm and said first and second surface widths are approximately 1 to 3 mm.

[c17]

17. The light coupling apparatus of claim 13 wherein said first and second

distances are substantially equal.

[c18] 18. A method of coupling the output of a linear diode laser array into an end of an optical fiber comprising the steps of:
optically coupling along a linear axis spaced at a first distance (d1) from said linear diode laser array a cylindrical lens having a length substantially equal to a length defined by said linear diode laser array, said cylindrical lens receiving emitted light from a plurality of diode lasers within said array and collimating said light;
optically coupling the collimated light from said cylindrical lens into a wedge-shaped coupling element, said coupling element positioned at a second distance (d2) from said cylindrical lens and having a length (L) extending from an input surface to an output surface, said input surface having a radius of curvature along a height (h), said height being substantially equal to said cylindrical lens length, said coupling element tapering from said input surface to said output surface, said input surface having an associated first width (w1) and said output surface having an associated second width (w2), the first width being substantially equal to a diameter of said cylindrical lens; and
optically coupling light from said output surface into an end of the optical fiber, said optical fiber having a diameter substantially equal to said second width.

[c19] 19. The method of claim 18 wherein said first width is greater than or equal to said second width.

[c20] 20. The method of claim 18 wherein said cylindrical lens has a circular, elliptical or hyperbolic cross-section.